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Date: November 23, 2009

Patent 0-05-109 - 15408/US/02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Bar-Yaakov et al.
Serial no.: 10/541,668
371(c) date: December 27, 2005
I.A. Filed: January 12, 2004
Title: FLAME RETARDANT FOR ENGINEERING
THERMOPLASTIC APPLICATIONS
Examiner: Megan MCCULLEY
Art Unit: 1796
Confirmation: 4122

Commissioner for Patents
P.O. Box 1450
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Dear Sir/Madam:

After-Final Response and Amendment

This response is being submitted in reply to the office action mailed on October 28, 2009.

Amendments

1. Please amend the claims as shown on the attached pages. Method claim 22 has been converted to the main claim, whereas original product claims 1-4 have been rendered dependent from the new main claim.

Currently amended claim 22 has been further amended to make the wording describing the reaction steps clearer; the step "providing low molecular..." is supported in the specification, at Example 1 on pages 6 to 7.

All other amendments, in claims 1-4, 6-10, and 20-22 are formal corrections intended to improve clarity of the text, without incorporating any new matter.

Claim Rejections – 35 USC §102

2. Claims 1, 3, 4, 6-10, and 21 were rejected as being anticipated by Nantaku et al. (JP 2001-310990).

Although differing with the Examiner on the relevancy of Nantaku, the Applicant now amends the set of claim so that the above rejected claims depend from claim 22, which is now converted to the new main claim. As original claim 22 was acknowledged by the Examiner to be novel in relation to Nantaku, it is believed that the subject matter of claims 1, 3, 4, 6-10, and 21 is also novel.

Claim Rejections – 35 USC §103, Claim 22

3. Claim 22 was rejected as being unpatentable over Nakai et al. (US 5,250,590) in view of Nantaku et al. (JP 2001-310990).

4. Amended claim 22 discloses a method for preparing a solvent-free HMW BE, comprising the following steps:

- a) preparing a LMW BE having a MW of between 650 and 3,500 which has less than 100 ppm organic solvents [said MW values correspond to the polymerization degree n in the Formulae of from 0 to 5];
- b) reacting said LMW BE with TBBA, and also with TBP or eventually tribromophenylglycidyl ether (TBPGE) or mixture of TBP+TBPGE, to obtain HMW BE of a MW between 7,000 and 50,000 [corresponding to the polymerization degree n of about 11 to 80].

It is shown to a person skilled in art that the step a) may be attained either by using reactants without solvents or by drying the reaction product and determining the solvent content in the LMW BE, thereby providing HMW BE with increased melt flow index, while minimizing corrosion of metal parts.

5. Nakai et al. relate to producing a HMW BE (lines 61-68 at column 4, lines 26-32 at column 6), comprising the following step:

- i) reacting LMW BE with TBP, to provide a HMW BE of the polymerization degree n between 2 and 30 (Table 1, column 6).

Nantaku et al. describe producing HMW BE (Examples 1-3), comprising the following steps:

- i) reacting LMW BE with TBBA, and eventually also with TBP, in the solvent, to obtain HMW BE of a polymerization degree n between 15 to 54; and eventually
- ii) drying the product.

6. A person skilled in art would have hardly combined the two teachings, in the time of the present invention, to provide the instant method as defined in above paragraph 4; the skilled person would have to modify the Nakai's reaction mixture by including TBBA of Nantaku, and further she/he would have to deduce that Nantaku's drying step would be more advantageous if used before the polymerization reaction than after it, *i.e.*, if used for drying the LMW intermediate rather than the final HMW product. The question is why would the person skilled in art have effected the improbable combination of Nakai with Nantaku – she/he could have had no reason to suppose that said modifications would lead to better processability, because improved flow index as a result of lowered solvent was a surprising finding of the present inventors, while Nakai et al. considered processability only in relation to molecular weight (lines 49-50 at column 1); and as for lowered corrosion of metal parts, Nakai et al. does not mention corrosion, and Nantaku merely relates to corrosion caused by gas (par. 0019) and not corrosion caused by liquid.

The Examiner notes (page 9, the last paragraph) that a person having the ordinary skill in the art would have found it obvious to use the LMW BE of Nantaku et al. in the process of Nakai et al. because of viscosity considerations. The fact is that Nakai et al. relate to viscosity (lines 49-50 at column 1) and decide to decrease the polymerization number n from 35-100 (line 47 at col. 1) to 2-30 (Table 1 at col. 6) – they did not need

Nantaku at all for this decision, and still less they would have been motivated to include any drying step anywhere in the process.

7. In view of the reasons discussed in above paragraphs 4-6, it is respectfully submitted that the method as defined in the instant amended claim 22 is novel and non-obvious over the cited documents.

Claim Rejections -- 35 USC §103, Claims 1-3, 6-10, and 21

8. Claims 1-3, 6-10, and 21 are rejected as being unpatentable over Nakai et al. (US 5,250,590) in view of Nantaku et al. (JP 2001-310990). Claim 20 is rejected as being unpatentable over Nantaku et al. (JP 2001-310990) as applied to claim 10 and in view of Chisholm et al. (US 2001/0009944).

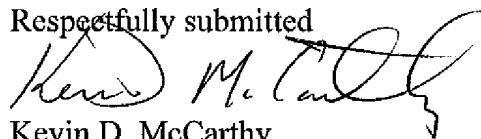
Although differing with the Examiner on the relevancy of the cited documents, the above rejected claims now depend from original claim 22, which is now converted to the new main claim. As original claim 22 is now believed to be novel and non-obvious over the cited documents, the subject matter of original claims 1-3, 6-10, and 21 -- now dependent to claim 22 -- is also novel and non-obvious.

It is also noted that Nakai et al. relate to a resin composition comprising styrene, whereas the instant composition, as defined in claim 10, lacks styrene.

Conclusion

9. The instant invention provides a method for preparing a flame retardant for polymer compositions, the retardant having advantageous properties, such as lowered corrosivity and lowered melt index. The claimed method differs in an apparently small detail from the prior art methods -- it incorporates a step of checking the solvent content in the reaction mixture; however, said apparently small detail results in unexpected advantages. Following the above explanations and the effected amendments, it is the Applicant's belief that the invention, as described in the amended claims, is novel and non-obvious over all the cited documents, and that the amended claims are ready for allowance.

Respectfully submitted



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